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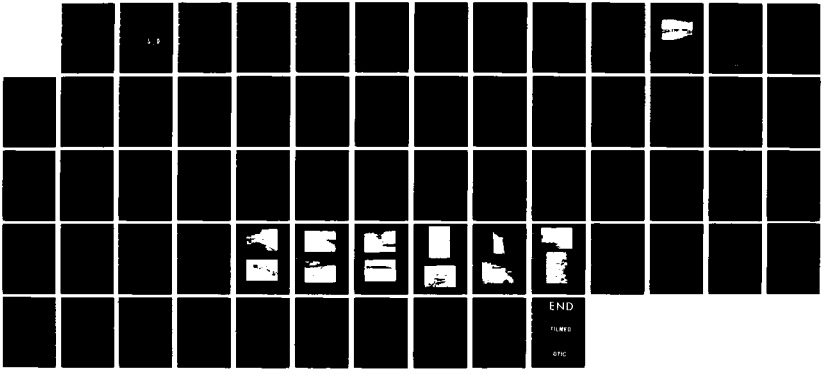

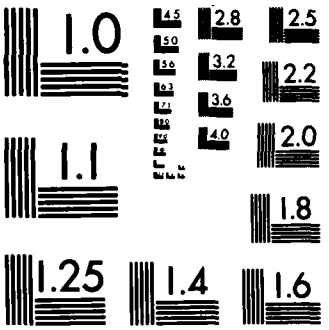

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HOUSATONIC RIVER BASIN
LEE, MASSACHUSETTS

LAUREL LAKE DAM
MA 00263

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Housatonic River Basin
Lee, Massachusetts
Sargent Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Laurel Lake Dam is about 390 feet long and 12 feet high. The dam is in fair condition. Slight seepage was ibserved at the gate house foundation and pavement cracking was observed along the upsteam edge of the crest. The dam is intermediate in size and the hazard classification is high.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUN 06 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

I am forwarding to you a copy of the Laurel Lake Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Kimberly Clark Corp., Lee, Massachusetts 01238.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

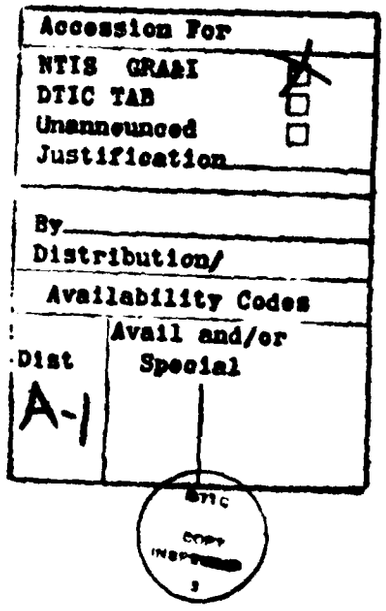
JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

LAUREL LAKE DAM
MA 00263

HOUSATONIC RIVER BASIN
LEE, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Identification No.: MA 00263
Name of Dam: LAUREL LAKE DAM
Town: LEE
County and State: BERKSHIRE COUNTY, MA
Stream: SARGENT BROOK
Date of Inspection: 7 September 1978

BRIEF ASSESSMENT

Laurel Lake Dam is approximately 390 feet long and 12 feet high. It consists of an earth embankment with a combination of riprap and concrete wall on its upstream face, a partial vertical stone masonry wall at its downstream face and a paved road on the crest. A gate or valve house is present at the downstream toe. A rectangular channel serving as the spillway is located at the right abutment of the dam.

The dam is in fair condition. Slight seepage was observed at the gate house foundation and pavement cracking was observed along the upstream edge of the crest. The discharge channel and downstream slope of the dam contain overgrown vegetation. Local failures and indications of movement were observed in spillway and discharge channel walls.

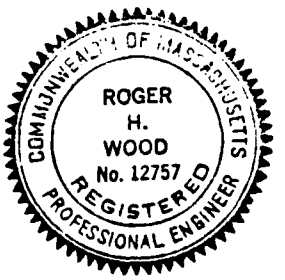
Based on the size, intermediate, and hazard classification, high, in accordance with the Corps of Engineers Guidelines, the spillway test flood is the Probable Maximum Flood (PMF). The test flood peak outflow was estimated to be 3,200 cfs and would result in overtopping the dam by approximately 2 feet. Hydraulic analysis indicates that the spillway will only pass 20 percent of the test flood.

Recommended additional investigations by the Owner include a detailed hydrologic-hydraulic study of spillway capacity, an investigation of structural stability of discharge channel and spillway walls and an investigation of seepage at the gate house foundation. Recommended remedial measures include the cutting of overgrown vegetation at the dam and discharge channel, the repair of locally eroded areas and voids in riprap, the removal of debris from the discharge channel and the attending to minor maintenance items at the spillway bridge and gate house. These recommendations and remedial measures as delineated in Section 7 of the report should be undertaken within one year of receipt of the report by the Owner.

CAMP DRESSER & McKee Inc.

Roger H. Wood

Roger H. Wood
Vice-President



This Phase I Inspection Report on **Laurel Lake Dam** has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm runoff), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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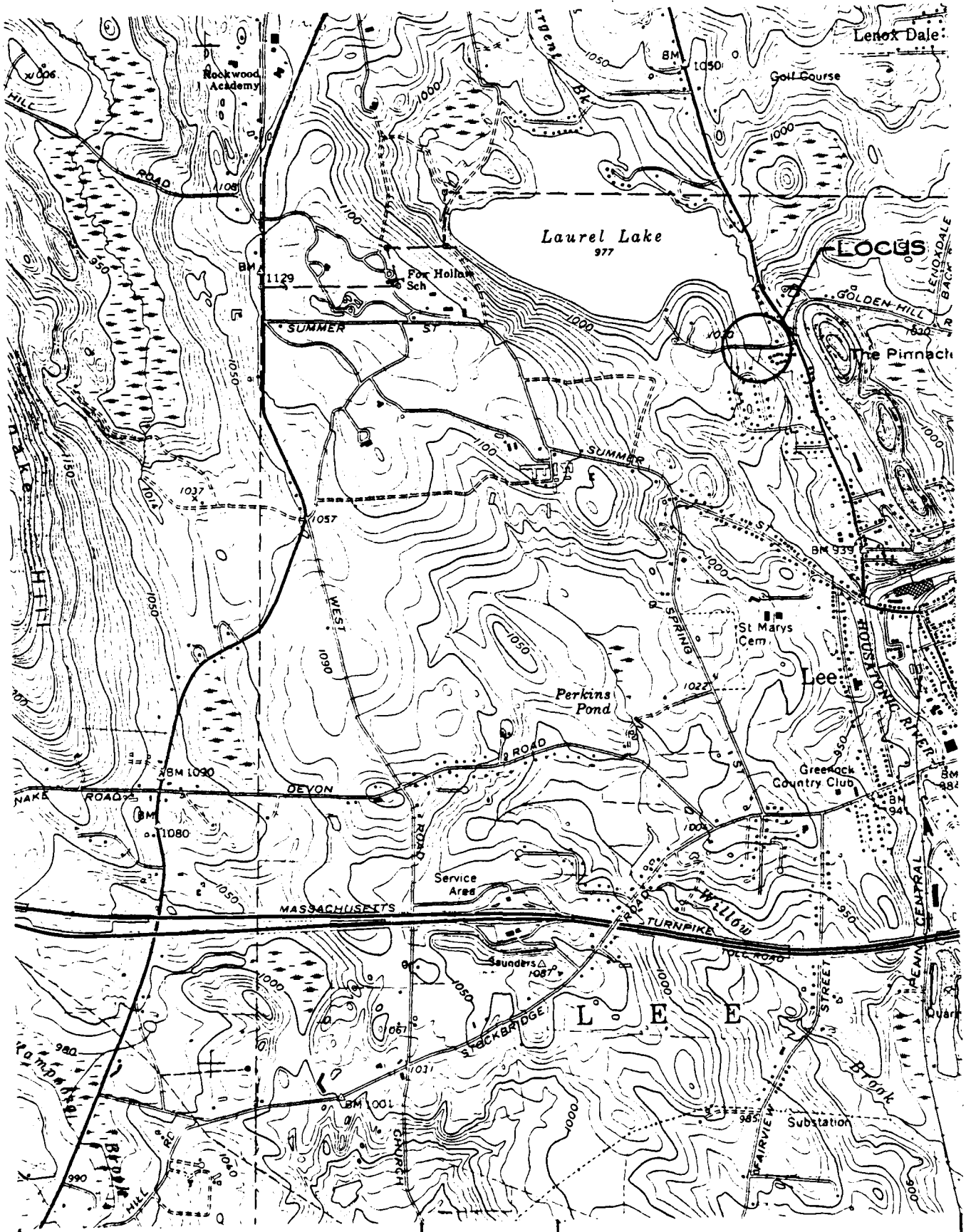
1. OVERVIEW OF UPSTREAM FACE OF DAM.



LAUREL LAKE DAM
IDENTIFICATION NO. = MA. 00263

N

LOCATION MAP
USGS QUADRANGLE
STOCKBRIDGE, MA.
Scale: 1"= 2000'

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LAUREL LAKE DAM
MA 00263

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region.

Camp Dresser & McKee Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Camp Dresser & McKee Inc. under letters of 12 July 1978 and 23 October 1978 from Colonel John P. Chandler, Corps of Engineers. Contract No. DACW 33-78-C-0354 has been assigned by the Corps of Engineers for this work. Haley and Aldrich, Inc. has been retained by Camp Dresser & McKee Inc. for soils and geological portions of the work.

b. Purpose - The primary purpose of the investigation is to:

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) ...urage and assist the States to initiate quickly ... ...tive dam safety programs for non-Federal dams.

(3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location - The dam impounds the waters of Sargent Brook to form Laurel Lake. The dam is at the southeast corner of Laurel Lake in the Town of Lee, Massachusetts, as shown on the report's location map. Water discharged from the spillway joins the Housatonic River at the north end of the center of the town. The dam is 500 feet west of U.S. Route 20, 1 mile north of the

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - The visual examination of the Laurel Lake Dam embankment did not reveal any evidence of failure, but it did disclose several deficiencies that should have near-term remedial treatment. In addition, the discharge channel wall exhibits local failures and one of the spillway wingwalls indicates movement has taken place. While failure of these walls may not directly cause a failure of the embankment due to the position of the discharge channel, the debris from such failures may further constrict the discharge channel causing higher lake levels and potential overtopping of the dam. The analysis of the spillway indicates that it is not capable of passing the test flood without overtopping the dam. Because of these, the dam is considered to be in only fair condition.

b. Adequacy of Information - Since there were no available drawings, all information for the Phase I Investigation had to be obtained from visual examination and limited measurements at the site. This information has been sufficient for the purpose of this investigation.

c. Urgency - The recommendations and remedial measures outlined in Sections 7.2 and 7.3 should be undertaken within one year of receipt of this report by the Owner.

d. Need for Additional Investigations - Additional investigations should be performed by the Owner as outlined in the following section.

7.2 Recommendations

It is recommended that the following additional investigations be performed by the Owner:

1. A detailed hydrologic-hydraulic investigation to determine the adequacy of the spillway and discharge channel and any necessary modifications to provide adequate capacity.

2. An in-depth investigation of the discharge channel and spillway walls to determine their structural stability and any necessary modifications to provide stable walls. This may require test excavations, surveys, borings and/or probings to determine the geometry of the walls.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations - There was no visible evidence of active dam embankment instability during the site examination on 7 September 1978. The slight flow appearing at the gatehouse showed no evidence of soil erosion or piping, and may not have been due to seepage through the embankment. The cracking along the upstream edge of the pavement does not appear to be recent; it may have been associated with past erosion of the upstream face.

The discharge channel walls do evidence signs of structural instability. Local failures have occurred in the stone masonry wall, toppling stones into the channel. The spillway left downstream concrete wingwall does indicate that movement has taken place.

b. Design and Construction Data - As far as is known, there is no available design or construction data on the Laurel Lake Dam embankment. Without information on the dam cross section and the physical properties of the earth fill, theoretical analyses of embankment structural stability are not possible.

The Laurel Lake Dam is not very high, and, in the absence of significant seepage, the relatively wide embankment would be expected to provide adequate stability under static loading conditions.

The absence of design data makes a theoretical analysis of the structural stability of discharge channel and spillway walls not possible. However, visual observations, as stated above, indicate that the structural stability of the walls is in question.

c. Operating Records - No operating records for the dam were located other than recent inspection reports by the state.

d. Post-Construction Changes - There are no available records of post-construction changes but it is understood that the riprap on the upstream face was placed in recent years, the spillway was rebuilt in 1932 and the downstream gatehouse was a later addition.

e. Seismic Stability - Laurel Lake Dam is located in Seismic Zone 1, and in accordance with recommended Phase I Guidelines, does not warrant seismic analysis.

The spillway capacity at top of dam (Elev. 980.5) is approximately 400 cfs. Additional analysis indicates that if the bridge over the spillway was removed or raised, the spillway capacity at top of dam would be about 510 cfs or 28 percent greater than under present conditions. While the bridge raising or removal would have more of an effect on spillway capacity at the test flood elevation, it could not pass more than one third of the test flood peak outflow.

f. Dam Failure Analysis - Dam failure analysis was performed to determine the magnitude of downstream hazards. A peak failure outflow of approximately 5,500 cfs was estimated based on a 20 percent breach width of the dam. The analysis indicates that Theresa Drive, which is approximately 1,400 feet downstream of the dam, would be overtopped by about 5 feet and at least 5 homes in the immediate vicinity would be flooded. U.S. Route 20, which is approximately 3,000 feet downstream of Theresa Drive, would be overtopped by about 2.5 feet and an additional 4 homes would be affected. The dam failure outflow would then enter the Housatonic River, causing flooding to homes and industries located immediately upstream of the U.S. Route 20 bridge over the Housatonic River. The potential loss of life is estimated to be greater than 10 persons. Accordingly, this dam is classified as having a "high" hazard potential.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General - Laurel Lake is a natural occurring, spring-feed body of water. It is reported that the existing dam was constructed around 1900 in order to raise the water level by 3 to 4 feet, thus increasing the storage for use by the owner. The present dam is located approximately 500 feet downstream of the original lake with water depths of only about 4 feet upstream. During the early 1900's a channel was excavated between the dam and the original lake and a wooden conduit installed so that water could be withdrawn from the original lake during droughts. A maximum water depth of 7 feet was measured at the inlet structure of the existing dam.

b. Design Data - No hydraulic/hydrologic design data are available for the dam. Field measurements indicate 3'-6" of freeboard between the spillway crest and top of dam.

c. Experience Data - There are no records of past floods at the dam site. The most significant discharge, according to the dam operator's recollection, occurred on December 31, 1949 when approximately 1 foot of flow was observed at the spillway.

d. Visual Observations - The lake level was below spillway crest at the time of inspection and no flow was present over the spillway. A portion of the spillway approach which was exposed as a result of the low lake level had a moderate growth of weeds. The discharge channel contained a significant growth of weeds and was partially clogged with debris and large stones from the partially failed left channel wall.

e. Test Flood Analysis - Based upon the Corps of Engineers guidelines, the recommended test flood for the size (intermediate) and hazard potential (high) is the Probable Maximum Flood (PMF). The PMF was determined using Corps of Engineers guidelines for "Estimating Maximum Probable Discharge" in Phase I Dam Safety Investigations. The watershed terrain was determined to be rolling and an inflow rate of 2,025 cfs per square mile was adopted for the 2.8 square mile drainage area. The resulting PMF inflow is 5,700 cfs.

Surcharge-storage routing of the PMF inflow through Laurel Lake, which is approximately 10 percent of the total drainage area, resulted in a peak test flood outflow of 3,200 cfs at a surcharge pool elevation of 982.6. At this stage, the dam will be overtopped by approximately 2 feet. The portion of the test flood which discharges through the spillway is 659 cfs or approximately 20 percent of the test flood.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures - In general, there is no established routine for the operation of the dam.

4.2 Maintenance of the Dam - The dam and spillway receive minimal maintenance. There is no established formal procedure for the maintenance of the dam. The downstream face of the dam and the downstream channel from the spillway have become overgrown with weed and brush growth.

4.3 Maintenance of Operating Facilities - There is no formal procedure for the maintenance of operating facilities. While the intake structure appears to have received maintenance, the downstream gatehouse appears to have received no attention. The dam is visited two to three times per week and the bar rack is cleaned on an as needed basis. The gate valves on the transmission pipeline at the dam are kept in the open position.

4.4 Description of any Warning System in Effect - There is no established warning system or emergency preparedness plan in effect for this structure.

4.5 Evaluation - Formal operational procedures, maintenance programs, warning systems and emergency preparedness plans should be established for the dam. Periodic inspections should be made of the dam and tree and brush growth at the dam and spillway should be brought under control. Maintenance of the structure should be performed at regular intervals.

the top of the dam. The right side of the channel is ledge and the left side is a masonry wall. A portion of the wall has collapsed into the channel. At the time of inspection no discharge was occurring and the downstream channel was dry and overgrown with brush.

3.2 Evaluation

The Laurel Lake Dam appears to be performing satisfactorily at the present time. While a number of embankment deficiencies have been observed, there does not appear to be a significant potential for failure as long as the observed conditions do not deteriorate. The facility is generally in fair condition based on the overgrown downstream face of the embankment, the seepage at the gatehouse foundation, the local failures in the discharge channel walls and the obstructions present in the discharge channel.

(4) Stones have been locally toppled from the downstream stone masonry walls.

(5) There is slight water flow, with iron staining, appearing from beneath the downstream gate house, as shown in Photo 8. It is not known whether the flow passes through or under the embankment, or is associated with the outlet conduit.

(6) Local failures have occurred in the discharge channel walls causing stones to fall into the channel as shown in Photo 13.

(7) The discharge channel is overgrown with weeds and brush and contains debris as shown in Photo 13.

(8) The spillway downstream left wingwall has separated from the bridge abutment and is experiencing a degree of tilt. Erosion is present along the base of this wall.

c. Appurtenant Structures - The bridge over the spillway, as shown in Photo 12, is in good condition. The railing and bridge stringers are exhibiting areas of rust and need repainting. The concrete adjacent to the right bridge abutment bearings has cracked.

The downstream gatehouse shown in Photo 7 has essentially been abandoned. Windows are broken and debris and water are present on the floor. The door is in need of repainting.

The outlet works inlet structure and control manhole shown in Photos 10 and 11, respectively, are in excellent to good condition with only minor rusting being noted on the metal work. Minor deterioration of the inlet structure concrete was also observed.

d. Reservoir Area - The area around Laurel Lake is generally wooded and sparsely developed. There are approximately 17 structures located at or below elevation 980.0. Although the dam site is located in the Town of Lee, the northern portion of the lake is within the Town of Lenox.

The side slopes into the pond are highly variable and generally wooded. There is no significant potential for landslides into the pond which could create waves that might overtop the dam. No conditions were noted which could result in a sudden increase in sediment load into the pond.

e. Downstream Channel - The spillway discharge channel is approximately 8 feet to 10 feet wide with an invert about 12 feet below

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General - The visual examination of Laurel Lake Dam was conducted on 7 September, 1978.

In general, the dam and spillway were found to be in fair condition. The downstream face of the dam is overgrown, hindering a close examination. The discharge channel contains debris and the channel walls are experiencing structural difficulties. The downstream gatehouse has essentially been abandoned. Seepage was noted coming from the gatehouse foundation.

A visual inspection checklist is included in Appendix A and selected photographs of the project are given in Appendix C.

b. Dam - The earth embankment is generally in fair condition. There is no visual evidence of major settlement, lateral movement, seepage or erosion, but there has been cracking and local erosion along the upstream edge of the pavement, and the downstream embankment slope is obscured by heavy weed growth.

The discharge channel is also generally in fair condition. The discharge channel from the spillway is partially clogged with debris and tree and brush growth. The left stone masonry wall of the channel has a number of partially failed areas. The left concrete wall at the spillway itself exhibits deterioration and and evidences some tilt.

The following specific items were noted:

(1) The upstream edge of the roadway pavement has numerous grass-filled cracks, as shown in Photos 3, 5 and 9. The pavement has also been undercut near the gate valve riser trunk, as shown in Photo 9, and there are bituminous patches and local surface sagging near the bridge.

(2) The downstream slope is irregular and has a heavy cover of weeds, as shown in Photos 4 and 6, that limits observation of the embankment condition.

(3) The upstream riprap is predominantly large angular pieces of rock (limestone), as shown in Photo 1, and has some gaps that have permitted local erosion of the underlying embankment. The riprap cover is particularly thin at the left end of the dam.

SECTION 2: ENGINEERING DATA

2.1 Design Records - There are no known design records for the dam.

2.2 Construction Records - No records of the original construction were located.

2.3 Operation Records - No operational records other than State inspection reports are available for the dam.

2.4 Evaluation - Since no engineering records are available, the evaluation of the dam must be based primarily on the results of the visual examination which is detailed in Section 3.

(7) Impervious Core----------Unknown

(8) Cutoff----------Unknown

(9) Grout Curtain----------Probably none

h. Diversion and Regulating Tunnel----------None

i. Spillway

(1) Type----------Rectangular channel

(2) Length of weir----------26 ft.

(3) Crest elevation----------977.0 (Est.)

(4) Gates----------None

(5) U/S Channel----------None

(6) D/S Channel----------8 to 10 ft. wide and 5 to 6 ft. deep

j. Regulating Outlets - The regulating outlet for this structure consists of a 10-in. C.I. transmission line which conveys the flow approximately 1 mile to a downstream mill. The pipe inlet has a bar rack and gate valve on the upstream face of the dam. A second gate valve and 10-in. C.I. blow-off is located within the gatehouse on the downstream toe of the dam. Both valves are normally in the open position and the flow rate is regulated at the pressure filter located in the downstream mill. Maximum withdrawal is 1500 gpm. A 10 inch filter bypass to a clear well at the mill may be used as an alternate blow-off.

(8) Top of dam----------980.5

(9) Test flood design surcharge----------982.6

d. Reservoir

(1) Length of test flood pool----------1.4 miles

(2) Length of recreation pool----------1.0 miles

(3) Length of flood control pool----------N/A

e. Storage (acre-feet)

(1) Recreation pool----------680 (Est.)

(2) Flood control pool----------N/A

(3) Spillway crest pool----------680 (Est.)

(4) Top of dam----------1,400 (Est.)

(5) Test flood pool----------1,895 (Est.)

f. Reservoir Surface (acres)

(1) Recreation pool----------170 (Est.)

(2) Flood-control pool----------N/A

(3) Spillway crest----------170 (Est.)

(4) Test flood pool----------252 (Est.)

(5) Top dam----------232 (Est.)

g. Dam

(1) Type----------Earth embankment

(2) Length----------Approx. 390 ft.

(3) Height----------Approx. 12 ft.

(4) Top Width----------20 to 25 ft.

(5) Side Slopes----------Irregular, Typ. 2:1 or flatter U/S and D/S except where vert. walls

(6) Zoning----------Unknown

shown on the USGS quadrangle, Stockbridge, Mass., 1973, was adopted as being the spillway crest elevation. All other elevations given in this report pertaining to the dam site were estimated from the assumed spillway crest elevation.

a. Drainage Area - The drainage area tributary to the dam site is 2.8 square miles. The rolling terrain surrounding the watershed is moderately forested and lightly developed. Laurel Lake accounts for approximately 10 percentage of the total drainage area.

b. Discharge at Dam Site - The maximum known reservoir level was approximately 1 foot above spillway crest on December 31, 1949.

(1) Outlet works size----------10-in C.I.

(2) Maximum known flood at damsite----------Unknown

(3) Ungated spillway capacity at top of dam.
400 cfs at elevation 980.5

(4) Ungated spillway capacity at test flood elevation.
659 cfs at elevation 982.6

(5) Gated spillway capacity at normal pool elevation---------N/A

(6) Gated spillway capacity at test flood elevation----------N/A

(7) Total spillway capacity at test flood elevation.
659 cfs at elevation 982.6

(8) Total project discharge at test flood elevation.
3,200 cfs at elevation 982.6

c. Elevation (ft. above MSL)

(1) Streambed at centerline of dam----------969 (Est.)

(2) Test flood tailwater----------Unknown

(3) Upstream portal invert diversion tunnel----------N/A

(4) Recreation pool----------977.0

(5) Full flood control pool----------N/A

(6) Spillway crest----------977.0

(7) Design surcharge (Original Design)----------Unknown

c. Size Classification - The hydraulic height of the dam is approximately 12 feet and the estimated total storage capacity at the top of dam is 1,400 acre-feet. According to guidelines established by the Corps of Engineers, the dam is classified in the intermediate category based on the storage capacity.

d. Hazard Classification - The results of the dam failure analysis indicate that a minimum of 9 homes would be effected by the flood wave and the potential loss of life would be greater than 10 persons. Consequently, the dam is the "high" hazard classification.

e. Ownership - The dam is owned by the Kimberly Clark Corp. The Owner's address is: Kimberly Clark Corp., Lee, MA 01238 (Phone: 413/243-1063). Mr. Edward Ochtman, Manager, at the same address is the Owner's representative. Prior owners of the dam include the Peter J. Schweitzer Corp. (before becoming a part of the Kimberly Clark Corp.) and the Smith Paper Company.

f. Operator - Mr. George E. Frulla is assigned the responsibility for the operation of the dam. His address is: Kimberly Clark Corporation, Lee, MA 01238 (Phone: 413/243-1063).

g. Purpose of Dam - The water impounded by the dam is used for processing at a local mill. Laurel Lake is currently being used for recreational purposes also.

h. Design and Construction History - There are no records of the design or construction of this dam. Discussions with local residents indicate that the dam was constructed around the year 1900. The dam increased the storage capacity of Laurel Lake The spillway at the dam was rebuilt in approximately 1932. In 1968, riprap was placed on the upstream face of the dam.

i. Normal Operational Procedure - There is no established procedure for the operation of the dam. The spillway has a fixed weir crest and requires no adjustment. The condition of the spillway, discharge channel, main dam embankment and the downstream gatehouse indicate little maintenance is performed on a routine basis. The dam is visited two to three times per week and the bar rack is cleaned on an as need basis.

Water is continuously withdrawn by the owner 24 hours per day, 365 days per year. A 10-in. C.I. transmission line conveys the water to a series of pressure filters located at the mill.

1.3 Pertinent Data - There are no known elevations previously established at the dam site. Consequently, the water surface elevation of 977

center of the Town of Lee and 1/2 mile south of the Lee-Lenox boundary line. A private road from U.S. Route 20 passes over the dam and spillway.

b. Description of Dam and Appurtenances - Laurel Lake Dam consists of an earth dam with a rock and concrete spillway at the right abutment. The length of the dam, not including the spillway, is approximately 390 feet. The length of the spillway crest is approximately 26 feet.

The dam embankment is approximately 12 feet high at its maximum point. It has a somewhat irregular cross section. The crest width is approximately 20 to 25 feet and has an 18 to 20 foot wide paved private road. The main portion of the upstream slope contains dumped riprap consisting of large rocks, approximately 3 feet by 5 feet. The riprap apparently covers over an older wall.

A concrete retaining wall is present along the upstream face for approximately the last 100 feet at the west end of the dam. The downstream slope is irregular with roughly a 2 to 1 slope at the ends of the embankment and in the upper regions of the higher portions of the embankment. The lower regions of the downstream slope at the center of the embankment contain a fieldstone retaining wall. Grass, weed and brush growth is present on the downstream slope with tree growth in the lower portions.

The spillway has a concrete weir at its entrance with an elevation at approximately the bottom of the spillway channel. In the area of the dam, the spillway channel appears to be natural ledge rock. The channel walls in the region of the dam are concrete. The private roadway is carried across the spillway on a steel and concrete roadway bridge. The downstream channel from the spillway is lined with fieldstone walls in a state of partial collapse.

An inlet structure is present on the upstream face of the dam approximately at its midpoint. The intake consists of a bar rack in a small reinforced concrete structure and a valve in a steel manhole at the upstream edge of the crest. Water is piped from this manhole through a 10-in. C.I. pipe to a concrete block gatehouse at the downstream face of the dam. The 20 foot by 20 foot by 10 foot high gatehouse contains a 10-in. gate valve and a 10-in. blow-off pipe which discharges through the sidewall of the structure. Water is conveyed by gravity from the gatehouse to the mill which is approximately 1 mile downstream.

3. An investigation of the seepage visible at the gatehouse foundation to determine its origin and effect, if any, on the dam embankment.

7.3 Remedial Measures

a. Operation and Maintenance Procedures - It is recommended that the following remedial work be undertaken by the Owner to correct deficiencies noted during the visual examination:

1. Cut grass and weeds on the embankment at least once a year, to permit observation of slope conditions and potential seepage locations. Remove trees including their stumps from the downstream toe and backfill the resulting voids.

2. Repair any locally eroded areas in the embankment, and place additional riprap as necessary to fill gaps between the existing riprap stones; this work should include the areas at the left end of the dam and at the gate valve manhole.

3. Remove brush and debris from the discharge channel and cut and remove overhanging trees.

4. Provide maintenance on appurtenant structures including replacement or shuttering of windows and repainting of steel and wood at the spillway bridge, gatehouse and outlet work intake.

Until the slight water flow at the gatehouse and the erosion and pavement cracking along the upstream edge of the dam can be shown to be unchanging long-term conditions and adequate spillway capacity is ensured, it is recommended that the Owner provide surveillance of the Dam during periods of unusually high precipitation or high lake levels. The Owner should also develop a formal maintenance program, formal operational procedures, and a formal emergency procedures plan and warning system in cooperation with local officials in downstream communities. Finally, it is recommended that the Owner establish a formal program of annual technical inspections.

7.4 Alternatives - Not applicable.

APPENDIX A

INSPECTION TEAM ORGANIZATION AND CHECK LIST

VISUAL INSPECTION PARTY ORGANIZATION

NATIONAL DAM INSPECTION PROGRAM

DAM: Laurel Lake

DATE: 7 September, 1978

TIME: 11:15 a.m.

WEATHER: Partly cloudy-65-70°F - Light to medium N.W. wind

WATER SURFACE ELEVATION UPSTREAM: 12-1/2" below spillway crest

STREAM FLOW: None over spillway

INSPECTION PARTY:

1. Roger H. Wood - Structural & Operations - CDM
2. Charles E. Fuller - Hydraulics-Hydrology - CDM
3. Joseph E. Downing - Ass't Hydraulics-Hydrology-Operations - CDM
4. Peter LeCount - Soils - H & A
5. _____
6. _____

PRESENT DURING INSPECTION:

1. George E. Frulla - Kimberly Clark Corp.
2. _____
3. _____
4. _____

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Laurel Lake DATE: 9/7/78

EMBANKMENT: Dam

CHECK LIST	CONDITION
1. Upstream Slope	1.
a. Vegetation	a. Grass & weeds above wall/riprap.
b. Sloughing or Erosion	b. Not obvious except slope cut back slightly (1-2 ft.) at left end of riprap; possible local loss between stones.
c. Rock Slope Protection - Riprap Failures	c. Large rock riprap extends down over concrete wall remnants, some gaps between stones.
d. Animal Burrows	d. None observed
2. Crest	2.
a. Vegetation	a. Grass in pavement cracks.
b. Sloughing or Erosion	b. Few local pavement sags at edges.
c. Surface cracks	c. Extensive grass-filled cracking on upstream side of pavement.
d. Movement or Settlement	d. Cracks & pavement patches & sags indicate local movements/settle. (typ. cracks < 1 in. wide & sags 1-2 in.); do not appear recent.
3. Downstream Slope	3.
a. Vegetation	a. Heavy grass & weed cover
b. Sloughing or Erosion	b. Local minor erosion where pavement runs off; stone masonry wall locally partly collapsed.
c. Surface cracks	c. Not evident*
d. Animal Burrows	d. Not evident*
e. Movement or Cracking near toe	e. Not evident*
f. Unusual Embankment or Downstream Seepage	f. Slight seepage from below bldg. at toe of embankment, has iron stain.*
g. Piping or Boils	g. Not evident*
h. Foundation Drainage Features	h. None observed
i. Toe Drains	i. None observed
4. General	4.
a. Lateral Movement	a., b., c. Slopes very irregular & pavement slightly irregular, but no indication of significant overall movement out of alignment.
b. Vertical Alignment	
c. Horizontal Alignment	
d. Condition at Abutments and at Structures	d. Slight settlement behind bridge abutment (2-4 in. max.) and around steel chamber at drain.
e. Indications of Movement of Structural Items	e. Pavement cracks may indicate movement of upstream wall; downstream masonry walls locally collapsed.
f. Trespassing	f. Few foot paths on slopes
g. Instrumentation Systems	g. None evident

*Difficult to observe.

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Laurel Lake DATE: Sept. 7, 1978

SPILLWAY:

CHECK LIST	CONDITION
1. Approach Channel	1.
a. General Condition	a. Good condition-Brush Right Side
b. Obstructions	b. None observed
c. Log Boom etc.	c. None observed
2. Weir	2.
a. Flashboards	a. None observed
b. Weir Elev. Control (Gate)	b. None observed
c. Vegetation	c. Grass and weeds in invert.
d. Seepage or Efflorescence	d. No major efflorescence
e. Rust or Stains	e. None observed
f. Cracks	g. Invert has shotcrete cover-some cracks
g. Condition of Joints	h. Loose areas and some spalls in invert
h. Spalls, Voids or Erosion	i. None observed
i. Visible Reinforcement	j. Good condition-There is no formal weir; it is more of an outlet channel
j. General Struct. Condition	
3. Discharge Channel	3.
a. Apron	a. Loose Rock
b. Stilling Basin	b. None present
c. Channel Floor	c. Ledge and Loose Rock
d. Vegetation	d. Weeds and small brush
e. Seepage	e. Area moist
f. Obstructions	f. Open joint stone masonry walls downstream has local failures into channel. Some branches and minor debris in channel. Trees overhang channel.
g. General Stuct. Condition	g. Fair condition due to downstream channel condition.
4. Walls Rt. & Lt. of	4.
a. Wall Location Spillway	a.
(1) Vegetation	(1) Minor growth in wall joints
(2) Seepage or Efflorescence	(2) No major efflorescence
(3) Rust or Stains	(3) None observed
(4) Cracks	(4) Crack at junction of wall at upstream face of dam. Shrinkage cracks present.
(5) Condition of Joints	(5) Deteriorated joint lt. downstream junction of wingwall. Jt. bottom of left wingwall deteriorated. Jt at bridge seat rt. upstream side deteriorated.
(6) Spalls, Voids or Erosion	(6) Erosion bot. of lt. downstream wingwall.
(7) Visible Reinforcement	(7) None observed
(8) General Struct.Condition	(8) Fair

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Laurel Lake DATE: Sept. 7, 1978

SPILLWAY: Continued

CHECK LIST	CONDITION
1. Approach Channel a. General Condition b. Obstructions c. Log Boom etc. 2. Weir a. Flashboards b. Weir Elev. Control (Gate) c. Vegetation d. Seepage or Efflorescence e. Rust or Stains f. Cracks g. Condition of Joints h. Spalls, Voids or Erosion i. Visible Reinforcement j. General Struct. Condition 3. Discharge Channel a. Apron b. Stilling Basin c. Channel Floor d. Vegetation e. Seepage f. Obstructions g. General Stuct. Condition 4. Walls a. Wall Location_____ (1) Vegetation (2) Seepage or Efflorescence (3) Rust or Stains (4) Cracks (5) Condition of Joints (6) Spalls, Voids or Erosion (7) Visible Reinforcement (8) General Struct.Condition 4. b. Wall Location Rt. end of Dam 5. Bridge over Spillway	4. b. (1) None observed (2) No major efflorescence (3) None observed (4) Shrinkage cracks-see also 4a(4) (5) Good (6) Minor chips and spalls (7) None observed (8) Good condition 5. Deck in good condition. Railing needs repainting. Bridge steel is rusted. Bridge expansion has caused cracks in rt. abutment

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Laurel Lake DATE: September 7, 1978
OUTLET WORKS:

CHECK LIST	CONDITION
1. Inlet	1.
a. Obstructions	a. None observed
b. Channel	b. Small channel - Intake 4 feet ± from face of dam.
c. Structure	c. Small concrete Intake - Some deterioration top and lower regions. Steel MH for gate valve near crest. Good condition some rust spots.
d. Screens	d. Bar screen - rusted
e. Stop Logs	e. None observed
f. Gates	f. Gate valve in MH
2. Control Facility	2.
a. Structure	a. Concrete block walls, concrete base and roof. Windows are gone. Door in fair condition. Debris on floor and roof. Water on floor. Bldg. appears to be abandoned.
b. Screens	b. None observed
c. Stop Logs	c. None observed
d. Gates	d. One gate on pipe
e. Conduit	e. Pipe
f. Seepage or Leaks	f. Seepage from D/S end of Bldg. Fndn.
3. Outlet	3. N/A
a. Structure	
b. Erosion or Cavitation	
c. Obstructions	
d. Seepage or Leaks	
4. Mechanical and Electrical	4. No lighting or mechanical equipment currently in use. Pump present in bldg but motor has been removed.
a. Crane Hoist	
b. Hydraulic System	
c. Service Power	
d. Emergency Power	
e. Lighting	
f. Lightning Protection	

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Laurel Lake DATE: 7 September 1978

HYDROLOGIC-HYDRAULIC CONSIDERATIONS:

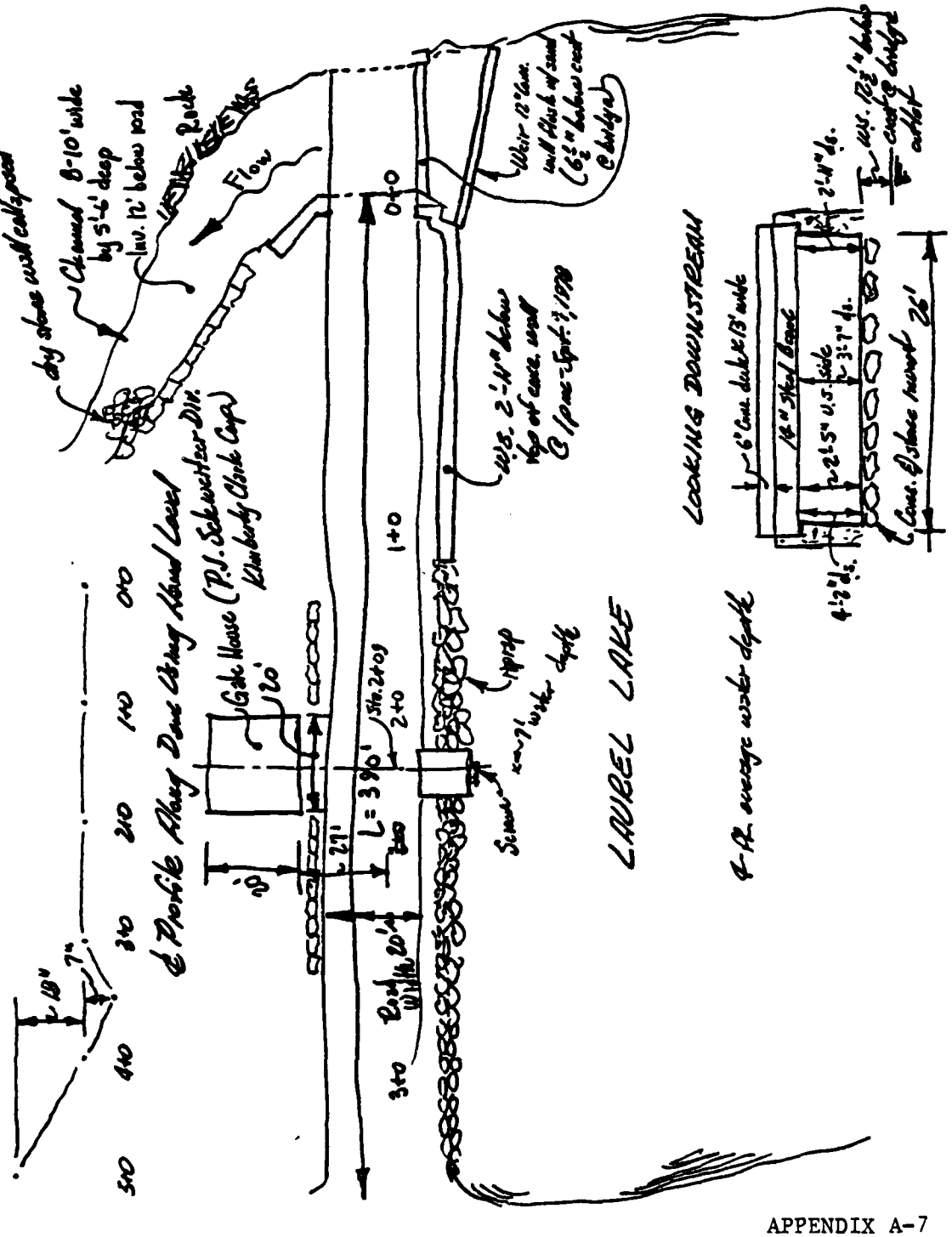
CHECK LIST	CONDITION
1. Upstream Watershed a. Type of Terrain b. Hydrologic Controls	1. a. Rolling terrain, moderately wooded b. None; one inlet stream
2. Reservoir a. Type of Terrain b. Development	2. a. Steeply sloped along southwest shoreline and moderate to midly sloped along remainder b. Approx. 17 cottages and homes along shoreline.
3. Spillway a. Adjacent Low Points b. Spillway Approach (Slope) c. Spillway Discharge (Slope) d. Spillway Type	3. a., b., c. See Field Sketch d. Rectangular channel under bridge, 26 ft. wide by 13 ft. long.
4. Downstream Watershed a. Reach No. 1 (1) Control (Bridge, dam, culvert, etc.) (2) Channel Characteristics (3) Development (4) Visible Utilities (5) Special Problems (Hospital, etc.) b. Reach No. 2 (1) Control (Bridge, dam, culvert, etc.) (2) Channel Characteristics (3) Development (4) Visible Utilities (5) Special Problems (Hospital, etc.)	4. a. Dam to Theresa Dr. (1) Theresa Dr. culvert: oval shaped steel pipe, 9-5" wide by 5'-0" high and 50 ft. long. (2) Channel dry and overgrown with weeds and brush, overbanks wooded. (3) Two new homes at Theresa Dr. (4) Telephone and electrical (5) None b. Theresa Dr. to Rte. 20 (1) 10'-6" wide by 5'-0" wide box culvert approx. 75 ft. long. (2) Same as 4.a(2) (3) 6 homes along Rte. 20 (4) None observed (5) None observed

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT National Dam Inspection
PROJECT Laurel Lake Dam
DETAIL Field Sketch

JOB NO
DATE CHECKED
CHECKED BY

PAGE
DATE 7 Sept., 1978
COMPUTED BY C. Fuller



APPENDIX A-7

APPENDIX B

LIST OF AVAILABLE DOCUMENTS AND PRIOR INSPECTION REPORTS

Page No.

LIST OF AVAILABLE DOCUMENTS

None Available

PRIOR INSPECTION REPORTS

L-168

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town LEE. Dam No. 1-2-~~350~~ 150-7.

Name of Dam Laurel Lake. Inspected by: RDJordan-PFFezzie.

Date of Inspection 1/29/74.

2. Prev. Inspection X.

Owner/s: per: Assessors_____.

Reg. of Deeds_____. Pers. Contact_____.

1. P J Schweitzer Div. Kimberly Clark Corp Lee, MA 243-1000
   Name St. & No. City/Town State Tel. No.

2. _____
   Name St. & No. City/Town State Tel. No.

3. _____
   Name St. & No. City/Town State Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

James Wright - P J Schweitzer Div Lee,MA 243-1000
Name St. & No. City/Town State Tel. No.

4. No. of Pictures taken 3.

5. Degree of Hazard: [if dam should fail completely]*

1. Minor_____. 2. Moderate_____.

3. Severe X. 4. Disastrous_____.

*This rating may change as land use changes [future development]

6. Outlet Control: Automatic_____. Manual X.

Operative X yes:_____no.

Comments:_____

_____

Upstream face of Dam: Condition:

1. Good X. 2. Minor Repairs_____.

3. Major Repairs_____. 4. Urgent Repairs_____.

Comments:_____

_____

_____

8. Downstream Face of Dam: Condition: 1. Good____. 2. Minor Repairs X.
3. Major Repairs___ 4. Urgent Repairs___.

Comments:_____

_____.

9. Emergency Spillway: Condition: 1. Good_____. 2. Minor Repairs_____.
3. Major Repairs_____.4. Urgent Repairs_____.

Comments:_____

_____

_____

10. Water level @ time of inspection: 0.3 . ft. above x . below_____.
top of dam_____.
principal spillway x .
other_____.

11. Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment x .
Animal Burrows and Washouts_____.
Damage to slopes or top of dam_____.
Cracked or Damaged Masonry x .
Evidence of Seepage_____.
Evidence of Piping_____.
Erosion_____.
Leaks_____.
Trash and/or debris impeding flow_____.
Clogged or blocked spillway_____.
Other_____.

12. Remarks & Recommendations: [Fully Explain]

The brush on the downstream slope has not been removed. This condition was reported in 1972. This brush should be removed to allow for easier inspection. A section of the easterly dry stone masonry channel wall is beginning to tip. This section is located approximately 30' below the spillway. The collapse of the wall would block channel and cause sloughing in the embankment. In the event that this occured there would be no danger of the dam failing; as the embankment is very wide in this area. However, to avoid costly repairs in the channel, the condition should be corrected. The spillway and embankment sections of the dam appear to be in good shape. No cracks or sloughing was noted.

In my opinion, this dam is safe.

The description of this structure was submitted in 1972. There are no changes to be noted.

For location, see Topo Sheet 2-D.

13. Overall Condition:

1. Safe X .
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____.
4. Unsafe _____.
5. Reservoir impoundment no longer exists [explain]

   Recommend removal from inspection list _____.

L-108

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town Lee. Dam No. 1-2-150-7.

Name of Dam Laurel Lake. Inspected by: RDJordan - RSpaniol

Date of Inspection 11-16-76.

2. Prev. Inspection X.

Owner/s: per: Assessors_____.

Reg. of Deeds_____. Pers. Contact_____.

1. P.J. Schweizer Division of Kimberly Clark Corp., Lee, MA 01238
   Name St. & No. City/Town State Tel. No.

2. _____
   Name St. & No. City/Town State Tel. No.

3. _____
   Name St. & No. City/Town State Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name St. & No. City/Town State Tel. No.

4. No. of Pictures taken 2.

5. Degree of Hazard: [if dam should fail completely]*

1. Minor_____. 2. Moderate_____.

3. Severe X. 4. Disastrous_____.

*This rating may change as land use changes [future development]

6. Outlet Control: Automatic_____. Manual X.

Operative X yes:_____no.

Comments:_____

_____

Upstream Face of Dam: Condition:

1. Good X. 2. Minor Repairs_____.

3. Major Repairs_____. 4. Urgent Repairs_____.

Comments:_____

_____

_____

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT ACE
PROJECT DAM INSP.
DETAIL LAUREL LAKE

JOB NO 260-5-12
DATE CHECKED 2-8-79
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PAGE 2 of 5
DATE 1-10-79
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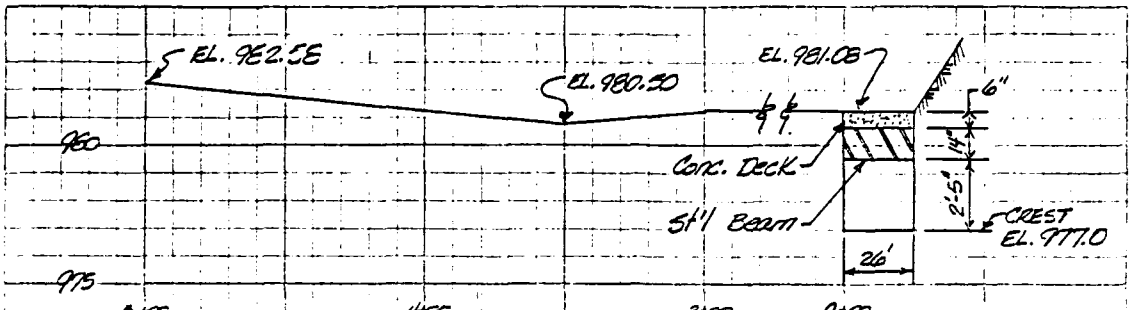
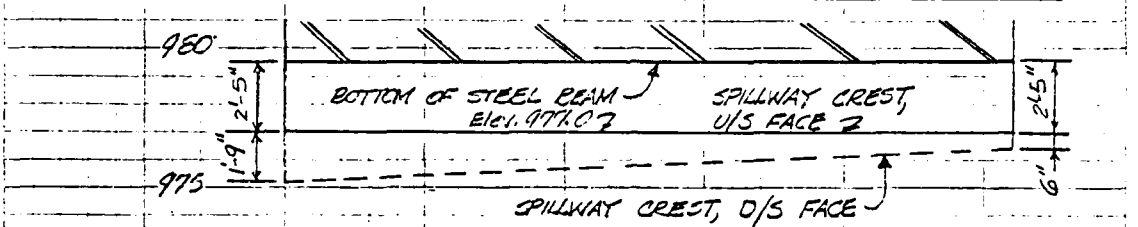
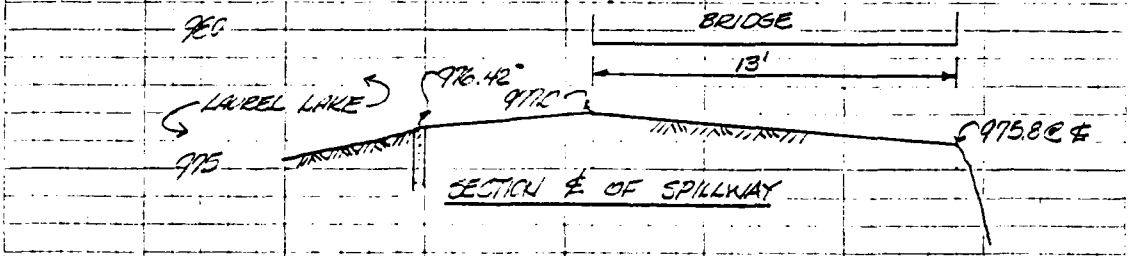


DAM PROFILE - U/S FACE



SPILLWAY ELEVATION

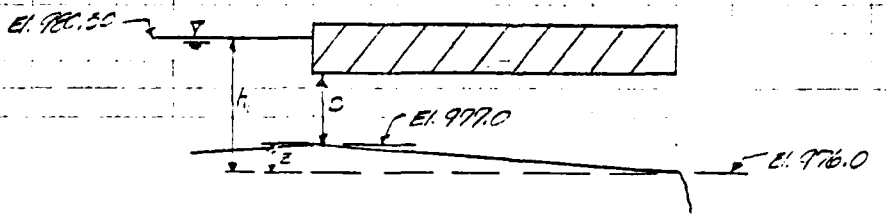


SECTION ℄ OF SPILLWAY

SPILLWAY DISCHARGE CHARACTERISTICS

1. Find discharge with W.S. EL. @ top of Dam (EL. 982.50)
Assume Inlet control with free discharge @ outlet

$$Q = CA_c\left[2g(h_1 - z)\right]^{1/2}$$



CAMP DRESSER & McKEE Environmental Engineers Boston, Mass.

CLIENT CCE
PROJECT DAM INSP
DETAIL LAUREL LAKE

JOB NO 380-5-12
DATE CHECKED 2-8-79
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PAGE 1 of 5
DATE 1-10-79
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ELEVATIONS

There is no known datum established at damsite. Therefore, assume spillway crest elev. = W.S. El. shown on USGS Quad.

Spillway Crest Elev. = 977.0
Top of Dam Elev. = 980.50

SURFACE AREAS (from USGS Quad: STOCKBRIDGE, MA. 1973)

D.A. = 19.55 [1] = 1795 acres = 2.8 mi²

Surface Area @ W.S. El. 977.0 = 1.85 [2] = 170 ac. = 0.27 mi²
" " " El. 980.0 = 2.53 [3] = 232 ac. = 0.36 mi²
" " " El. 990.0 = 3.35 [4] = 310 ac. = 0.48 mi²

STORAGE VOLUMES

At Spillway Crest: 170 ac. x 12 ft. avg. depth x 1/3 = 680 ac-ft.
At Top of Dam: $680 + \left(\frac{170+232}{2}\right) 3 + 232 \times 0.50$

$= 680 + 603 + 116 = 1400$ ac-ft.

At El. 990: 680 + 603 + (232+310)/2 x 10 = 4000 ac-ft.

SIZE CLASSIFICATION

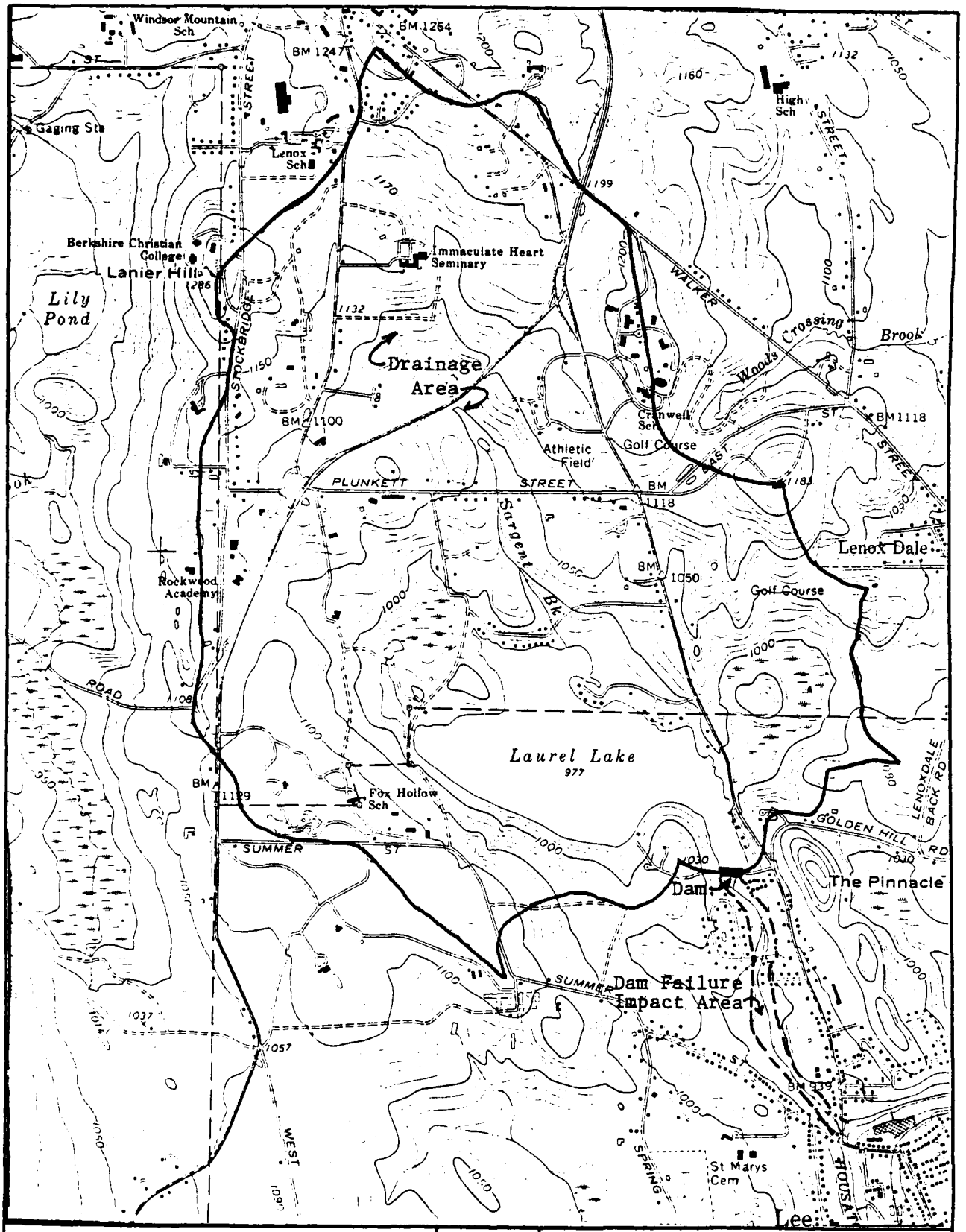
Hydraulic Ht. = 12 ft.
Storage @ Top of Dam = 1400 ac-ft.
} ∴ INTERMEDIATE

HAZARD CLASSIFICATION

Dam failure analysis (pages 1 of 4 thru 4 of 4) indicates that at least 9 homes would be inundated with the potential loss to life being > 10. ∴ HIGH Hazard

TEST FLOOD

Intermediate Size & High Hazard → TEST FLOOD = PMF



DAM Laurel Lake Dam

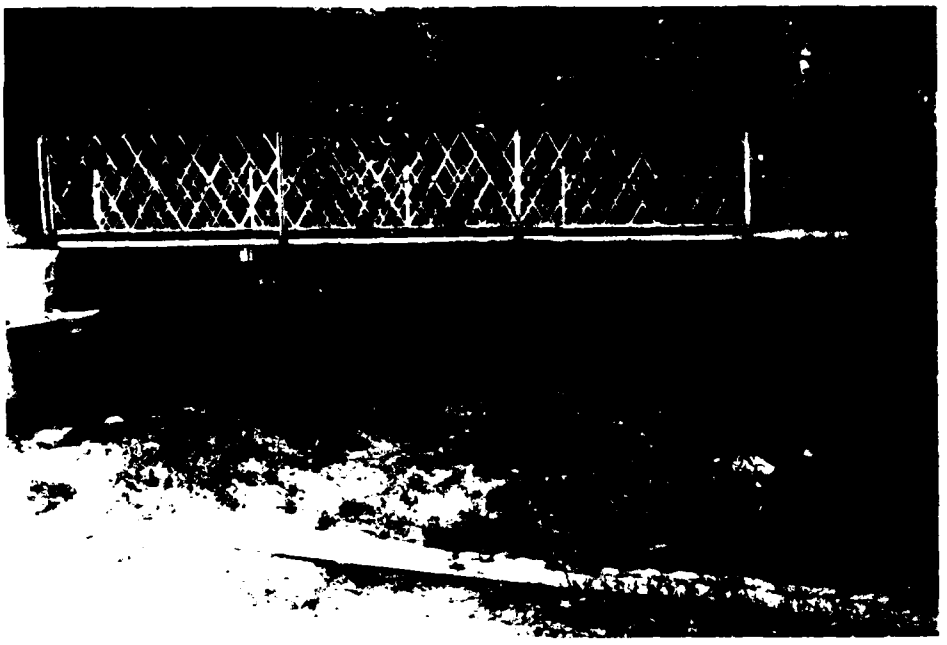
IDENTIFICATION NO. MA 00263

DRAINAGE AREA MAP
USGS QUADRANGLE
STOCKBRIDGE, MA

APPROX. SCALE: 1" = 2000'

APPENDIX D-1

APPENDIX D
OUTLINE OF DRAINAGE AREA AND HYDRAULIC COMPUTATIONS

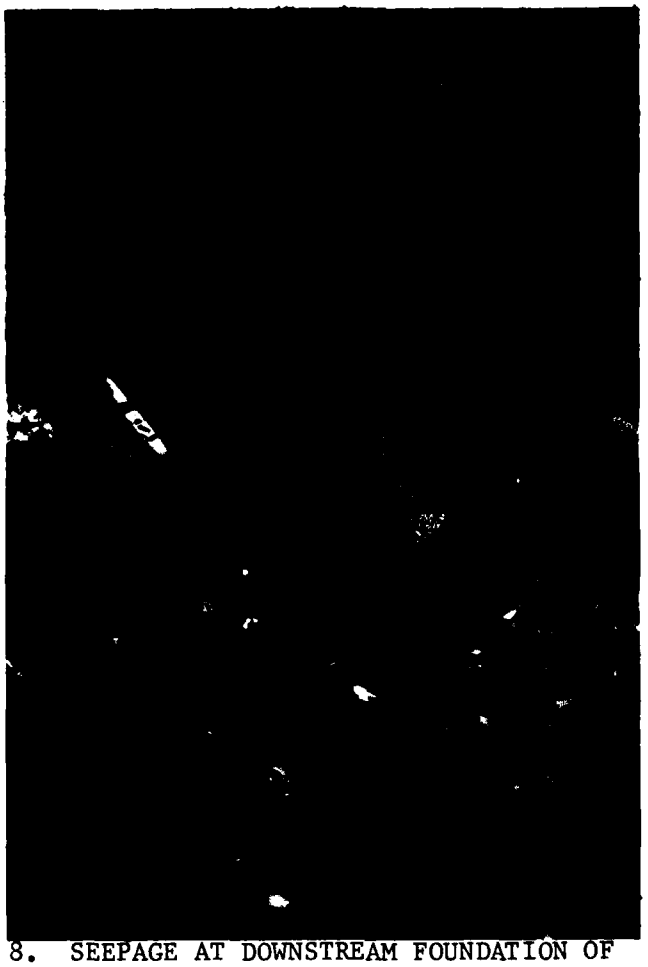


12. SPILLWAY APPROACH CHANNEL AND BRIDGE OVER SPILLWAY.

13. VIEW TOWARDS SPILLWAY BRIDGE FROM DOWNSTREAM CHANNEL. NOTE CHANNEL WALL FAILURES.

10. BAR RACK AT INLET STRUCTURE.

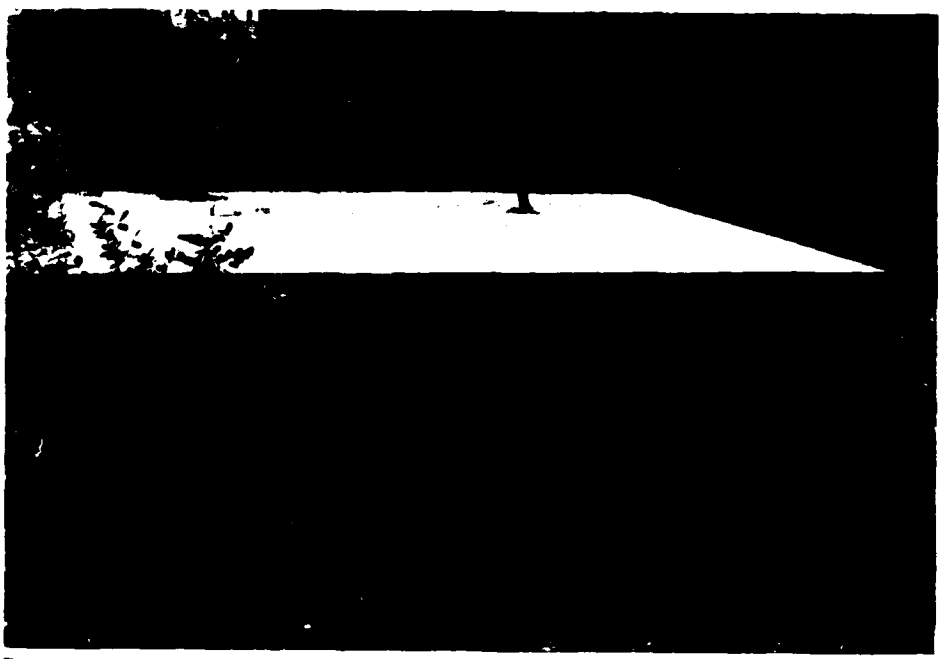
11. VALVE AT INLET STRUCTURE.



8. SEEPAGE AT DOWNSTREAM FOUNDATION OF GATEHOUSE.

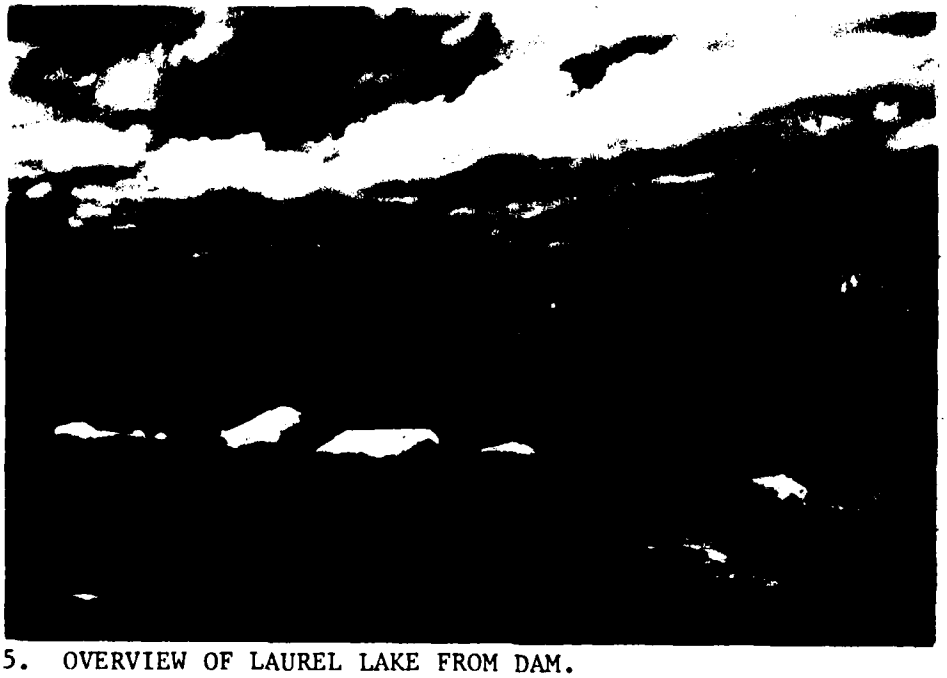
9. INLET STRUCTURE AT UPSTREAM FACE OF DAM.

6. DOWNSTREAM FACE OF DAM BEHIND GATEHOUSE.



7. GATEHOUSE.

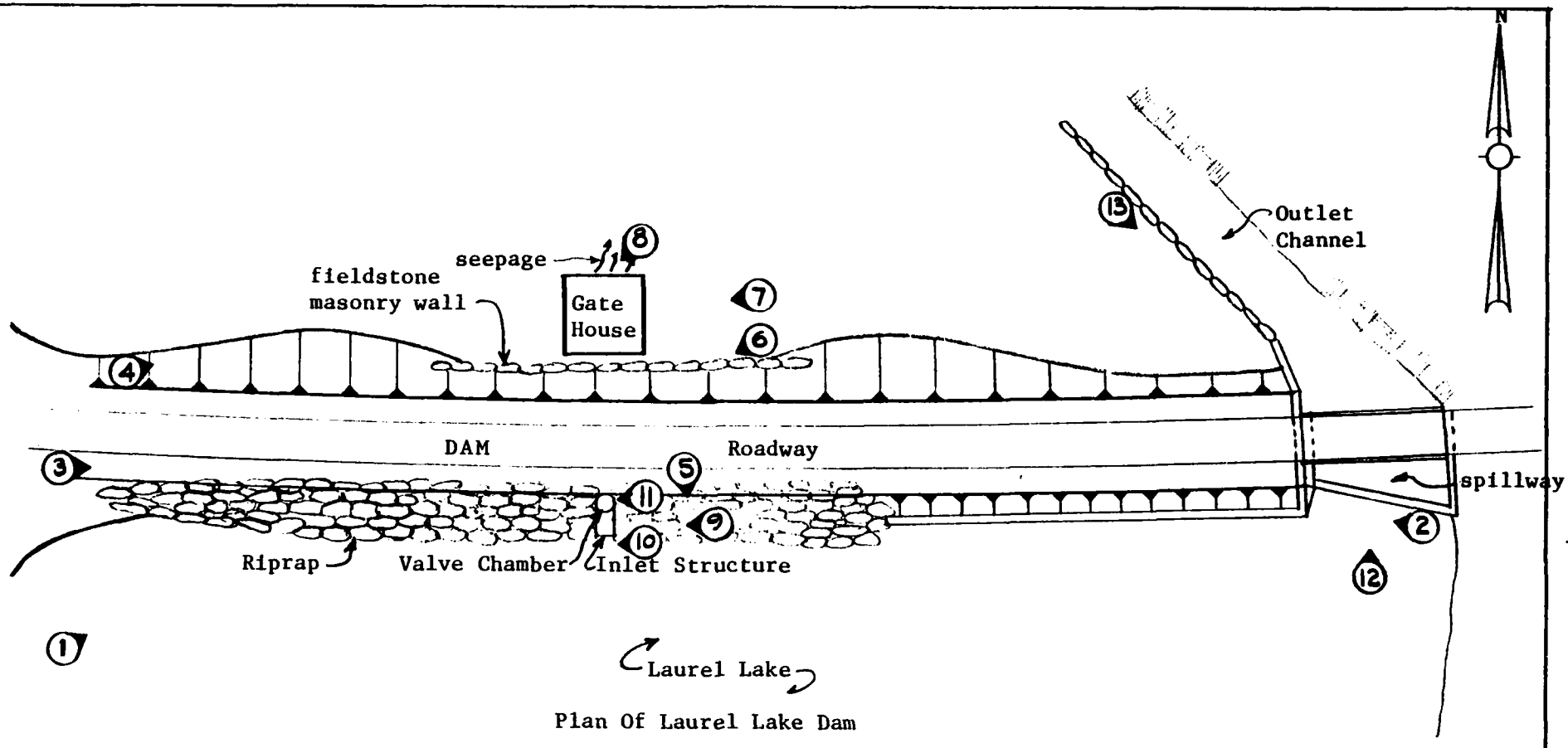
4. DOWNSTREAM FACE OF DAM.



5. OVERVIEW OF LAUREL LAKE FROM DAM.

2. UPSTREAM FACE OF DAM FROM RIGHT ABUTMENT. SPILLWAY IN FOREGROUND.

3. UPSTREAM FACE OF DAM FROM LEFT ABUTMENT.



Plan Of Laurel Lake Dam

Note: (1) Denotes direction of view and photograph number.

National Program of Inspection
of Non-Federal Dams
Location of Photographs
Laurel Lake Dam
Lee, Massachusetts

APPENDIX C-1

APPENDIX C

SELECTED PHOTOGRAPHS OF PROJECT

12. Remarks & Recommendations: [Fully Explain] PREVIOUS INSPECTION DATE: January 29, 1974

The heavy brush reported in 1974 has been ~~repaired.~~ removed. The embankment appears to be stable, there us no visible evidence of settlement or sloughing.

Approximately 15' of the easterly channel wall below the spillway has collapsed and another 20' will fall in the near future. The easterly wing wall atthe spillway bridge is tipped. The failure of the wall has caused a partial blockage of the channel and some erosion of the embankment.

The owner should be advised to clear the channel, repair the wall and take steps to prevent the possible future failure of the wing wall.

As previously reported, the wall failure does not endanger the dam as the embankment is very wide in this area.

For location see Topo Sheet 2-D.

13. Overall Condition:

1. Safe ____X____.
2. Minor repairs needed ____X____.
3. Conditionally safe - major repairs needed _____.
4. Unsafe _____.
5. Reservoir impoundment no longer exists [explain]

   Recommend removal from inspection list _____.

8. Downstream Face of Dam: Condition: 1. Good X. 2. Minor Repairs___.
3. Major Repairs___ 4. Urgent Repairs___.

Comments:_____

_____

9. Emergency Spillway: Condition: 1. Good_____. 2. Minor Repairs_____.
3. Major Repairs_____. 4. Urgent Repairs_____.

Comments:_____

_____

_____

10. Water level @ time of inspection: 0.3" ft. above____. below__X_.
top of dam_____
principal spillway_____X_____.
other_____

11. Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment_____.

Animal Burrows and Washouts_____.

Damage to slopes or top of dam_____.

Cracked or Damaged Masonry_____X_____.

Evidence of Seepage_____.

Evidence of Piping_____.

Erosion_____.

Leaks_____.

Trash and/or debris impeding flow_____.

Clogged or blocked spillway_____.

Other_____.

h_1 = 980.50 - 976.0 = 4.50 ; h_2 = 977.0 - 976.0 = 1.0

$(h_1 - h_2)/D = (4.50 - 1.0)/2.5 = 1.4$ OK

A_o = 2.5' x 26.0' = 65 ft.²

C value from USGS Book 3, Chap. A3, p. 44, Table 7 where $\frac{h_1 - h_2}{D} = 1.4$ and wingwall $\theta = 90° \rightarrow C = 0.41$

$Q = 0.41 \times 65 \times [64.4(4.50 - 1.0)]^{1/2} = 400$ cfs

Vel. = 400 cfs / 65 ft² = 6.16 fps

II Find discharges for W.S. El. > top of dam, L C = 3.0

W.S. Elev.	H over Dam (ft.)	Q weir (cfs)	h over Spillway (ft.)	Q spill (cfs) Below bridge	Q spill (cfs) Above Bridge	TOTAL Q (cfs)
980.50	0	0	4.5	400	0	400
981.00	0.5	55	5.0	428	0	483
982.0	1.5	1242	6.0	478	70	1790
983.0	2.5	3610	7.0	524	208	4440
984.0	3.5	7256	8.0	566	390	8210

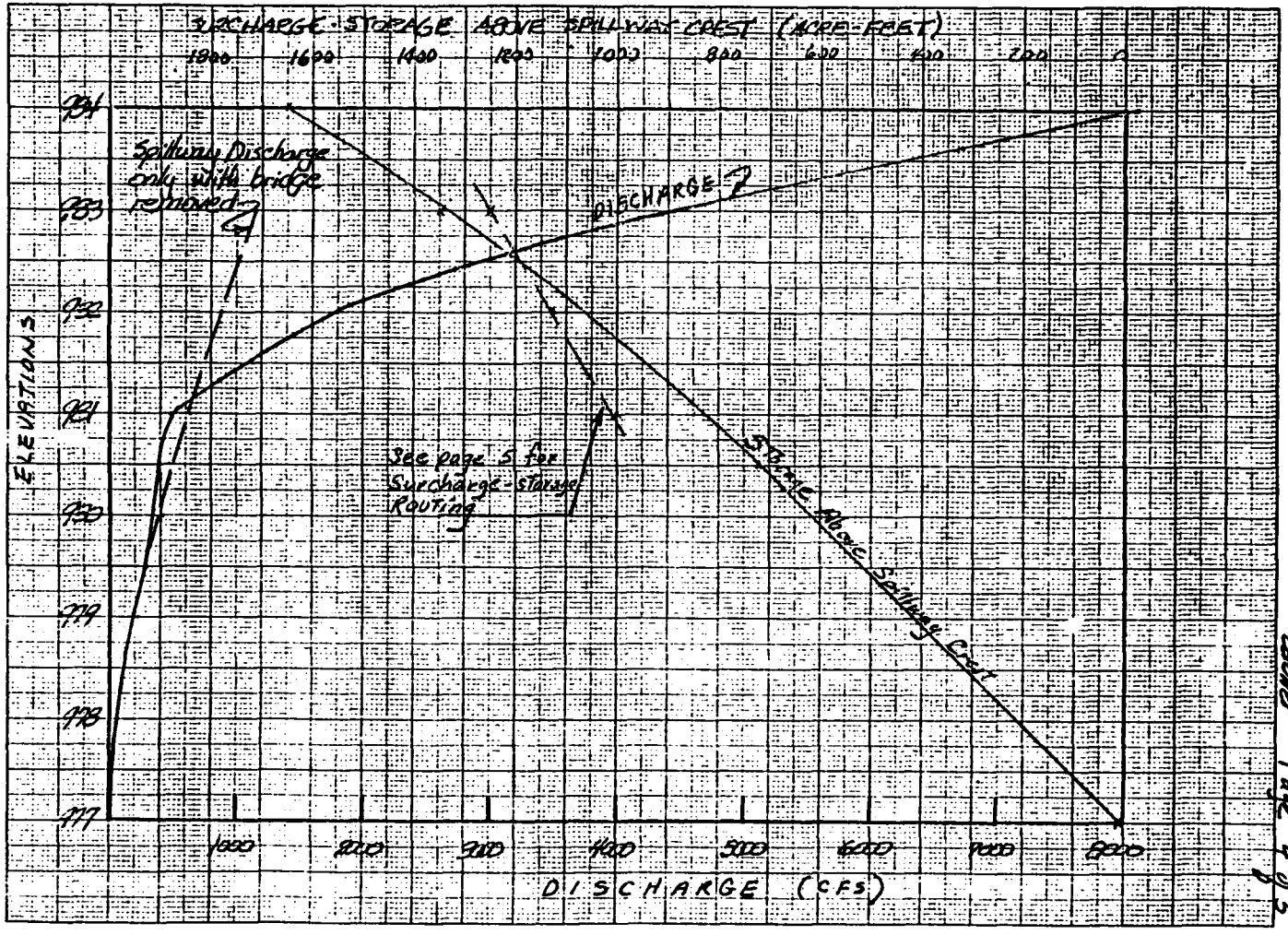
III Determine Spillway Discharge Capacities with bridge raised or removed.

$Q = CLH^{3/2}$

C = 3.0
L = 26 ft.

Assume abutments are extended vert.

W.S. Elev.	Head (ft)	Flow (cfs)
977.0	0	0
978.0	1.0	26
979.0	2.0	220
980.0	3.0	405
981.0	4.0	624
982.0	5.0	872
983.0	6.0	1146



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Environmental Engineers
Boston, Mass.

CLIENT CCE
PROJECT DAM INSP.
DETAIL LAUREL LAKE

JOB NO. 330-5-12
DATE CHECKED 2-8-79
CHECKED BY [illegible]

PAGE 5 of 5
DATE 1-16-79
COMPUTED BY JED

PMF DETERMINATION

Drainage Area = 2.8 mi^2, Rolling Terrain

From CCE Guidelines for estimating PMF Inflows:

2025 CSM x 2.8 mi^2 = 5670 cfs say 5700 cfs INFLOW

SURCHARGE - STORAGE ROUTING

$Q_{P_2} = Q_{P_1}\left(1 - \frac{STOR.}{R.O.}\right)$ where R.O. = 1" & Q_{P_1} = 5700 cfs

$STOR. = (19)(1 - Q_{P_2}/5700)$

Q_{P_2} (cfs)	STOR (in.)	STOR (ac-ft.)	Elev. (from Curve on p. 4)
4000	5.67	848	981.02
3500	7.33	1097	982.05
3000	9.00	1346	983.00

When the above are plotted on the Stage-Discharge curve, the resulting outflow is ~ 3200 cfs and the corresponding storage is 1215 + 680 = 1895 ac-ft

EVALUATION

Test Flood Inflow = 5700 cfs
Test Flood Outflow = 3200 cfs
Test Flood Surcharge Elev. = 982.60

∴ Low Point of Dam will be overtopped by
982.6 - 980.50 ≈ 2.1 ft. depth

Spillway Capacity @ test flood elev. 982.6
(524 - 478) x 0.6 + 478 = 506 cfs

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CLIENT COE | JOB NO. 390-5-12 | PAGE 1 of 4
PROJECT DAM INSP | DATE CHECKED 2-8-79 | DATE 1-2-79
DETAIL LAUREL LAKE | CHECKED BY Miller | COMPUTED BY JED

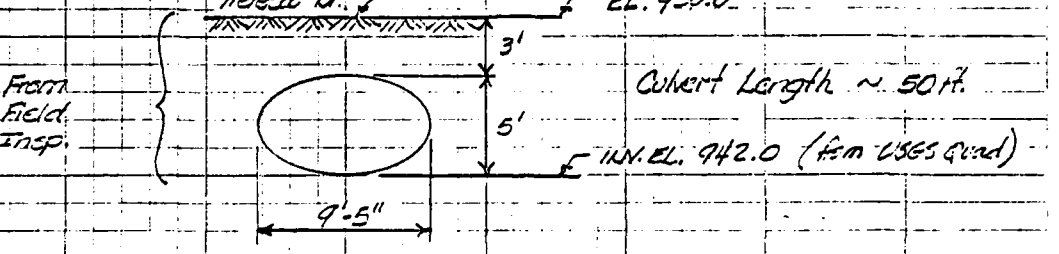
DAM FAILURE ANALYSIS

Downstream toe of embankment is 12 ft. max. below top of dam. At outlet, W.S. was ~5 ft. below top of dam and water depth ~ 7 ft. max. ∴ $Y_o = 12$ ft.

Length of dam, not including spillway is 390 ft. However, water depths U/S are reported to be 4 ft. with W.S. @ spillway crest for approx. 500 ft.±, except for excavated channel to outlet. ∴ assume $W_b = 20\% L = 0.2 \times 390 = 78$ ft.

Then $Q_p = 3.27 \times (78) \times (32.2)^{1/2} \times (12)^{3/2} = 5,450$ cfs

Reach No. 1 Dam to Theresa Drive ~1400 ft.



Find Q with U/S W.S. @ 950.0 & D/S W.S. @ 947.0

$$Q = CA_o \left(\frac{2g(h_1 - h_4)}{1 + \frac{29C^2n^2L}{R_o^{4/3}}} \right)^{1/2}$$

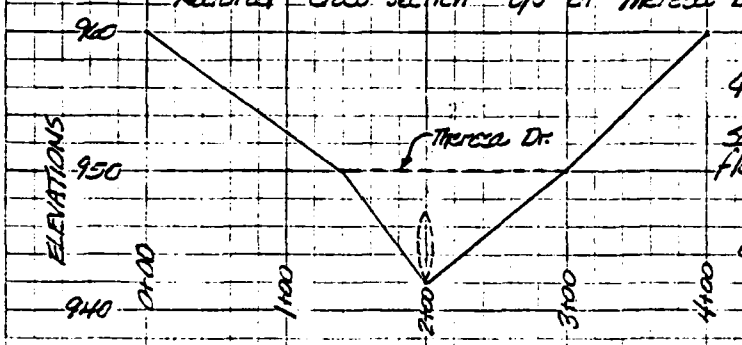
where $C = 0.9$
$A_o = (0.7854)(9.42)(5.0) = 37.0$ ft.^{2}
$h_1 = 8$ ft.
$h_4 = 5$ ft.
$n = 0.015$
$L = 50$ ft.
$R_o = 37 / \pi(9.42^2/2 + 5^2/2)^{1/2} = 1.56$

$$Q = (0.9)(37)\left[\frac{(2)(32.2)(8-5)}{1 + \frac{(29)(0.9)^2(0.015)^2(50)}{(1.56)^{4/3}}} \right]^{1/2}$$

$$= 33.3 \times \left(\frac{193.2}{1.146} \right)^{1/2} = 432 \text{ cfs}$$

DAM FAILURE ANALYSIS (Cont.)

Natural Cross Section u/s of Theresa Drive from USGS QUAD



Q_{P_1} = 5,450 cfs

Say culvert capacity with flow over road = 1/3 450 cfs

$Q_W = CLH^{3/2}$
where C = 2.6
L = 160 ft
H = unknown

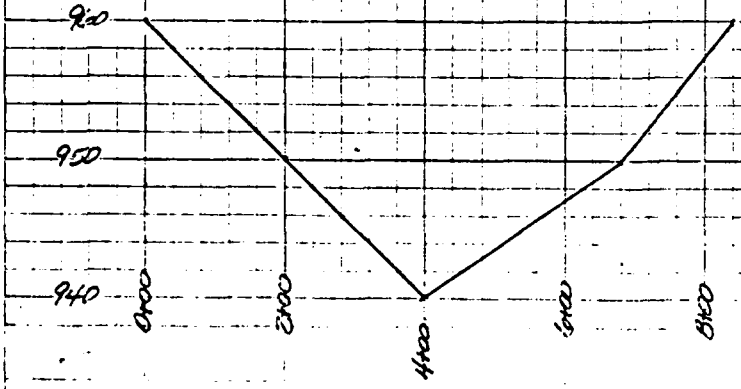
Then $H = (Q_W/CL)^{2/3} = (5{,}000/2.6 \times 160)^{2/3} = 5$ ft.

Then W.S. ELEV. = 955.0

① From USGS QUAD, no structures are located @ or below Elev. 955.0 u/s of Theresa Dr. However, field inspection indicated two new homes which do not show on Quad Sheet (under const. adjacent to culvert) but that would be affected.

② Immediately d/s of Theresa Dr. there are 6 homes at or below Elev. 155.0 according to the USGS QUAD.

REACH No. 2 : X-Sect. @ 300 ft. d/s of Theresa Drive



$Q = \frac{1.49}{n} \cdot A \cdot R^{2/3} S^{1/2}$

n = 0.03
S = 10/1600 = 0.00625

A & R vary with depth (y)

DAM FAILURE ANALYSIS (Cont.)

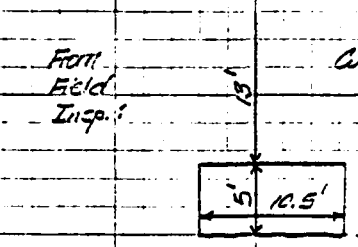
W.S. EL.	depth (ft.)	Area (ft.²)	P	R = A/P	Q (cfs)
946.0	6	664	288	3	7,060
945.0	5	600	240	2.5	4,340

Max W.S. EL. @ Q = 5,450 cfs:

$$945.0 + (5,450 - 4,340) / (7060 - 4340) \times 1.0 = 945.41$$

C. From USGS Quad, there are at least 3 homes below El. 945.0

REACH NO. 3 - Rte 20, ~ 3000 feet d/s of Theresa Dr.

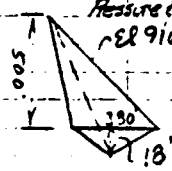


Type 5 Flow - Inlet Control

$Q = CA_o[2g(h_1 - z)]^{1/2}$, let $z = 0$, $A = 10.5 \times 5 = 52.5\ ft^2$

W.S. Elev.	h_1	h_1/D	C	Q (cfs)
900	8	1.6	0.52	620
905	13	2.6	0.59	900
910	18	3.6	0.63	1130
Pressure Weir → 912	20	4.0	0.65	#4393

#$Q_w = (28)(400')(2)^{1.5} = 3,166$



Estimate Storage Volume u/s of Rte. 20:

W.S. @ 910.0, Vol. = $\frac{(350)(18)}{2} + 0\ (800')(\frac{1}{3}) = 525,000\ ft^3 = 12.05$ ac-ft.

Since ~ 1/3 of the storage below spillway crest can not be released, New Stor. @ Top of Dam = 1400 - 680 + 680 x 1/3 = 1,173 ac-ft.

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Q_{p_1} = 5,450 cfs

Stage @ Rte. 20 for 5450 cfs ~ El. 912.5
Volume Ufc of Rte. 20 @ El. 912.5 ~ 16 ac-ft.

then $Q_{p_2} = 5{,}450 \left(1 - \frac{16}{1193}\right) = 5{,}375$ cfs : minimal reduction

At El. 912.5 stage, ~4 homes along Rte. 20 will be affected and the Rte. 20 culvert will be overtopped. The outflow, (~5,375 cfs) will enter the Housatonic River.

The total risk to life from reaches 1, 2, & 3 is > 10

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY | MO | YR
MA	243	NED	MA	003	01				LAUREL LAKE DAM	4218.7	7316.0	00FEB79

(15) POPULAR NAME	(16) NAME OF IMPOUNDMENT
	LAUREL LAKE

(17) REGION	(18) BASIN	(19) RIVER OR STREAM	(20) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(21) DIST FROM DAM (MI.)	(22) POPULATION
01	07	TR-HOUSATONIC RIVER	LEE	1	6400

(23) TYPE OF DAM	(24) YEAR COMPLETED	(25) PURPOSES	(26) STRUCTURAL HEIGHT (FT.)	(27) HYDRAULIC HEIGHT (FT.)	(28) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	(29) IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)
REFRCTPG	1900	RS	12	12	1400	680

DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
NED	N	N	N	N	07MAR79

(30) REMARKS
21-STONE AND CONCRETE

(31) D/S HAS	(32) SPILLWAY CREST LENGTH	(33) TYPE	(34) WIDTH (FT.)	(35) MAXIMUM DISCHARGE (FT.)	(36) VOLUME OF DAM (CY)	(37) POWER CAPACITY INSTALLED (MW)	(38) POWER CAPACITY PROPOSED (MW)	(39) NAVIGATION LOCKS NO.	(40) LENGTH (F.)	(41) WIDTH (F.)	(42) LENGTH (F.)	(43) WIDTH (F.)	(44) LENGTH (F.)	(45) WIDTH (F.)	(46) LENGTH (F.)	(47) WIDTH (F.)
1	416	U	26	400												

(48) OWNER	(49) ENGINEERING BY	(50) CONSTRUCTION BY
PJ SCHWEITZER DIV OF		

(51) REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

(52) INSPECTION BY	(53) INSPECTION DATE DAY | MO | YR	(54) AUTHORITY FOR INSPECTION
CAMP DRESSER AND MCKEE INC	07SEP78	PL 92-367

(55) REMARKS
46-KIMBERLY CLARK CORP

END

FILMED

6-85

DTIC